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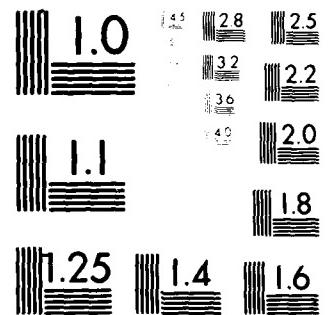
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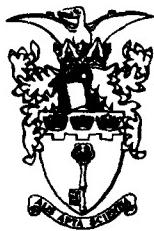


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by

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SWEDISH DEFENCE RESEARCH ABSTRACTS 1979/80-1
[FRÖ FÖRSVARS FORSKNING REFERAT 1979/80-1]

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EDITOR'S SUMMARY

The Swedish Research Institute for National Defence issues a quarterly list of unclassified Reports published by the Institute. The titles of these Reports and informative abstracts have been translated in English. This volume is the first issue of 1979/80. Further volumes will be translated in due course. The main topics covered are: Protection - atomic, biological, chemical; ammunition and weapons; conduct of war, information and commands; vehicles and spacecraft; reliability and logistics; human factors; associated studies and their solutions; positive methods for limitation and control of armaments; psychology reports.

EDITOR'S NOTE

The Reports are in Swedish unless some other language is indicated (usually English). When requesting Reports it should be appreciated that an English version will not normally be available, and that the prices of the original Swedish documents have not been indicated in this Translation. Reports may be obtained from

FOA P Rapportredaktion, 104 50 Stockholm 80, Sweden

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A PROTECTION - ATOMICA2 Characteristics of nuclear explosions

(1) FOA Report C 20321-A2

KVAST - a computer program to compute the shielding effects of buildings against residual radiation

Eva Elvers and others

August 1979

KVAST is an interactive computer program which uses an American method, known as the standard method, to compute the shielding effects of buildings against residual radiation (*kvarvarande strålning*), that is ionising radiation from radioactive fallout on the roof of a building and on the surrounding ground. The shielding effect - the ratio of the dose inside the building and the dose in the open - can be computed both for isolated buildings and for buildings where allowance is made for any adjacent premises by defining bands of equivalent width up against the external walls. The report contains a description of the method of computing and a user's guide to *KVAST*. New data are defined by answering questions, the number of which depends on a description of the actual building. Modifications to the data-base are made by means of an order or by questions.

A3 Effects of nuclear explosions, and protective measures

(2) FOA Report C 40100-A3

Production of cereals, meat and milk in the vicinity of the nuclear power station at Barsebäck

Marianne Gillberg-Wickman

April 1979

The report concerns the geographical distribution of the number of milking cows, the total number of pigs and the area under cereals within a radius of 30 km round the nuclear power station at Barsebäck. This basic information is intended for use in calculating the contamination of foodstuffs and the level of exposure to radiation from food in the event of a major uncontrolled leak from the power station.

(3) FOA Report C 40101-A3

Production of cereals, meat and milk in the vicinity of the nuclear power station at Simpevarp

Marianne Gillberg-Wickman

April 1979

The report concerns the geographical distribution of the number of milking cows, the total number of pigs and the area under cereals within a radius of 30 km round the nuclear power station at Simpevarp. This basic information is intended for use in calculating the contamination of foodstuffs and the level of exposure to radiation from food in the event of a major uncontrolled leak from the power station.

(4) FOA Report C 40102-A3

Radiation injury to humans after exposure to high radiation doses from nuclear weapons and the effects of a military attack on a nuclear power station

Gunnar Walinder

June 1979

The present report constitutes a development of the earlier TOX Report, 'Radioactive risks to the public in an emergency and in wartime. FOA papers on the Civil Defence practice week, Spring 1977'. The object was to improve some of the assessments made in the earlier report of the extent of radiation injuries and of protective measures for the public when exposed to high radiation doses from nuclear explosions and military attack on nuclear power stations.

The principal difference from the earlier TOX study is the calculation of injurious effects of prolonged radiation. Both the 'Rasmussen Report' and the estimates by NRPB are unsatisfactory in this respect.

B PROTECTION - BIOLOGICALB1 Consideration and appraisal of the threat from biological attack
Forecasts and summaries

(5) FOA Report C 40094-B1

Some aspects of preventive medicine as a protection against biological weapons

Gunilla Eriksson and Thomas Olsson

January 1979

Medical factors relevant to the ability of infectious substances to break through the body's defence mechanisms are discussed, the following points being considered as significant.

(1) The nonspecific defence against infection is least effective in the lower respiratory passages, where a few aerosol-borne micro-organisms can succeed in causing disease, whereas infection via the digestive tract requires considerably greater amounts of infectious substances.

(2) The specific defence against infection (the immune response) is activated after vaccination or contact with a naturally occurring infective agent, and affords a specific though not absolute protection from the infections concerned. In a normal population protection covers only a few diseases and is easily deduced by an attacker (public vaccination programmes etc) so that infective agents against which the protection is not effective are easily identified.

(3) The effects of infective agents against which an immune response is absent will become restricted by facilities for treatment with antibiotics or chemotherapy, and in a few cases by immunotherapy.

The report has been produced as a part of the study by B Group with the objective of research into technique, doctrine and future warfare (ABC warfare). The work has been tasked on the FOA by the Ministry of Defence.

B2 Protective measures

(6) FOA Report C 40097-B2

International symposium on analytical applications of bioluminescence, and chemiluminescence, Brussels, 1978: Report of visit
Thomas Olsson and Anders Thore February 1979

The application of luminescence reactions for analytical purposes has greatly intensified in recent years. The application of luminescence analyses for rapid analysis is being studied at the FOA in connection with the indication and identification of bacteria. The symposium was the first of its kind in Europe and attracted participants from most of the luminescence groups in Europe and the USA. Altogether some 40 lectures were delivered, seven of which were by groups directly or indirectly associated with the FOA. The principal subjects were ecology/water purification/environment, cells/physiology of growth, clinical microbiology, clinical chemistry and reagents/measuring techniques.

The bulk of fundamental scientific research into the chemistry of luminescent reactions is considered to lie in the USA, while applications of the techniques of clinical analysis are mainly being developed in Europe. A large part of the applied work is being performed by groups associated with the FOA.

C PROTECTION - CHEMICAL

C1 Consideration and appraisal of the threat of chemical warfare.
Forecasts and summaries

(7) FOA Report A 40027-C1

Biomedical effects of tear gases. A review of the literature
Lars Frankenberg and Nils Karlsson February 1979

Information has been collected from the literature concerning mainly the physiological and toxicological effects of four different tear gases. The substances investigated are dibenzo (b,f)-1,4- oxazepine (CR), 2-chlorobenzylidene malononitrile (CS, K62), chloroacetophenone (CN) and bromoacetone (BA). The information includes the effects on both experimental animals and on human subjects. Evaluations of the risks in using tear gases are also reported.

The documentation on BA is scanty, and that on CN rather better. A fairly comprehensive documentation exists on CR and even more on CS. The review

shows that the modern tear gases CS and CR have both better irritant properties and lower toxicity than the older types, BA and CN. CR is the most effective tear gas and also the least toxic. This is followed by CS and CN. It is generally true that the risk of eye injuries is greater when tear gas is used in the solid form than when employed as a solution or aerosol. The risk of producing serious eye injury is very small in the normal use of tear gas in the aerosol form. Exposure to CN in the solid form or to BA as a liquid or a concentrated gas entails a considerable risk of serious and acute eye injury, while the risk of such injury is small for CS and in particular for CR.

(134 references).

- (8) FOA Report C 40098-C1
Toxic blue-green algae
Christer Mattson and Gertrud Puu

February 1979

Laboratory studies of toxins from blue-green algae during the recent decade have led to a better knowledge of the structure and action of these toxins. This report deals briefly with the toxin from *Microcystis aeruginosa*, which is a cyclic peptide, and that from *Aphanizomenon flos-aquae* of unknown structure. Emphasis is placed on the toxin from *Anabaena flos-aquae* (anatoxin a). This toxin is a cyclic substance of low molecular weight. Its effect is on the neuro-muscular level. The toxin possesses depolarising and blocking properties, with a long action period.

C2 Protective measures

- (9) FOA Report C 40103-C2
Prototype fresh-air helmet. Preliminary study
Tage Berglund

June 1979

This preliminary study briefly describes some possible alternative forms of the M 51 face shield, principally with a view to its use in the Air Force. Some different theoretical solutions are presented, and a prototype has been made and compared under in-flight conditions with four other patterns of all-enclosing mask.

C3 Injuries and treatment

- (10) FOA Report C 40096-C3(C1)
Reactivation of inhibited choline esterase
Johan Sundelin

February 1979

A review is given of the subject of the reactivation of inhibited choline esterase, discussing among other things the mechanism of the reactivators and the problem of ageing. The properties and inhibition of the enzyme acetyl choline esterase are also discussed. The report concludes with a brief practical description of a method of determining the reactivating ability of a compound.

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D AMMUNITION AND WEAPON TECHNOLOGYD1 Technology of explosives

- (11) FOA Report C 20322-D1
 Investigation of the stabiliser content in a scrapped batch of propellant. 3. Analyses in 1979 of previously examined propellant tubes
 Ingemar Ohlsson September 1979

A scrapped batch of propellant was re-examined. The stabiliser and stabiliser derivatives were determined by means of thin-film chromatography. Of a 10 kg charge, which was non-uniform at the time of manufacture, six tubes of propellant out of 35 which had been previously examined and marked were analysed again. The results show that only slight modifications have occurred since the previous analysis in April 1975.

D5 Target analysis

- (12) FOA Report C 20325-D5
 Firing tests with steel splinters against trotyl-filled cylindrical charges
 Lennart Pettersson September 1979

This investigation forms one stage towards improving the information for calculating the effect of weapons on various targets containing shells. Tests show that if a splinter enters the explosive a deflagration (incomplete detonation) may occur which splits the casing, but otherwise causes only moderate damage. Since the number of tests was small, the result should not be used in the context of protection to demonstrate that detonation cannot occur by the impact of splinters on shells.

The tests were performed in 1964-65.

D6 Protection from exploding warheads

- (13) FOA Report C 20320-D6 (A3)
 Civil defence and civil defence research in the USA
 Vilhelm Sjolin July 1979

This is a report of impressions gained from a symposium held by the Defense Civil Preparedness Agency from 18-22.3.1979 in Asilomar, California. The symposium covered multi-disciplinary questions concerning the objectives for American civil defence and presented some current research into the effects of shock waves and fire. The object was to provide information for further research studies.

The first part of the report deals with developments in American civil defence, and some limited comparisons are drawn with the situation in the USSR.

It is followed by threat scenarios and some possible attack situations of current interest to civil defence in the USA. The report concludes with a general account of research activities into fire and shock waves.

A detailed account of the technical and scientific content of the symposium is supplied in a separate report, 'Blast/Fire Interactions 1979' which will be published by SRI International in autumn 1979.

- (14) FOA Report C 20323-D6 (D8)
 Model for the front propagation in a detonating gas
 Sven Wahlborn and Hjördis Celander

September 1979
 (in English)

The general laws for the propagation of an explosive wave in a perfect gas are stated and expressed in the form of a few characteristic equations. Solutions of these are discussed for the case of a transient detonation process, where the velocity of the front (U) is assumed to vary in a regular manner with the position of the front (R). From a simplified model, which is defined essentially by the Hugoniot condition and the requirement of total conservation of energy, an explicit relationship is derived between U and R for a strong detonation (the spherical case). This model is applied to an unlimited divergent detonation and to a laser-driven detonation, as examples. Conclusions can be drawn as to the qualitative validity of the model and the criteria of initiation for the processes concerned.

- (15) FOA Report C 20324-D6
 Calculating the temperature in fire exposed shelters
 Bengt Häglund and Rolf Jansson

September 1979
 (in English)

The report describes a computer model for calculating the temperature and heat transfer in a shelter. In order to verify the model and the thermal parameters employed, the calculated results were compared with measurements from twelve well-defined full-scale experiments. The effects of fire, ventilation and dry or damp internal heat sources in the shelter were specially studied.

The following results were obtained. The model could be used to calculate the curve of air temperature to accuracies of better than $\pm 2^{\circ}\text{C}$ for all the tested combinations of different conditions. In particular the investigation demonstrated the importance of the correct description of heat transfer in the shelter model, including inter alia the condensation of water on cold surfaces. Also very important was that the correct assumptions were made for heat transfer from the fire to the shelter. The report gives a relatively detailed description of the model and the methods of calculation. A shorter version in Swedish with emphasis on the results will be published later.

E CONDUCT OF WAR - INFORMATION AND COMMAND TECHNIQUE

E1 Reconnaissance, target plotting and fire control

(16) FOA Report C 30154-E1

An X-band array antenna module with Si-IMPATT diode amplifier

Herbert Steyskal

March 1979

(in English)

This reports on the design of an integrated transceiver module, which comprises a three-stage Si-IMPATT diode amplifier for 9 GHz of 1 W output and 20 dB gain, and also an analogue ferrite phase shifter, PIN diode switch limiter stage, balanced mixer and IF amplifier. Testing methods are described for the transmitting and receiving functions, giving measurement results with the emphasis on phase stability as a function of temperature, voltage and time. It concludes with an account of tests with ICW drive of a single IMPATT diode amplifier stage. Conclusions are drawn from the test results as to some desirable improvements to the design of the module.

(17) FOA Report C 30155-E1

An X-band array antenna module with GaAs IMPATT diode amplifier

Herbert Steyskal

April 1979

(in English)

The introduction describes the design of an integrated double transceiver module. It comprises a three-stage GaAs IMPATT diode amplifier of 1 W CW output and 20 dB gain at 9 GHz, an analogue phase shifter, PIN diode cutout and balanced mixer.

This is followed by test methods for the transmitter and receiver sides. Test results are reported for the transmitter, receiver and control components, with the emphasis on phase data as functions of temperature, voltage and time. Phase and amplitude-following in both transmitter units of the double module are measured both for constant voltage and constant current at varying temperatures.

The transmitters were also tested on ICW drive with a low duty factor. Conclusions are drawn from the test results as to some desirable improvements in the present design of the module.

(18) FOA Report C 30156-E1

X-band FET amplifiers for applications in phased arrays

Herbert Steyskal

June 1979

(in English)

The report gives a description based on measurements of the properties of some new X-band power amplifiers designed with GaAs field-effect transistors.

Two amplifiers are discussed, a commercial one of 100 mW CW output and a development model of 1 W CW output.

Microwave data of importance for application to phase-controlled phased arrays have been measured in CW and ICW drive. Particular interest is devoted to the output phase as a function of amplifier voltage, signal power and temperature. The measurement methods are described.

It was found that FET amplifiers have properties suitable for application to active modules for electrically controlled antennas. They are superior to diode amplifiers as regards efficiency and phase properties.

- (19) FOA Report C 30171-E1
 Laser-induced fluorescence from algae: results from a field experiment at sea
 Britt Hartmann and others July 1979

Measurements are reported of laser-induced fluorescence from algae during a shipborne experiment in the Baltic. The object was to obtain information to evaluate the feasibility of an airborne laser fluorescence sensor, chiefly for the monitoring of chlorophyll, but also for the identification of water pollution in the form of oil and chemicals. The results show good agreement between the laser results and those obtained by hand. However some uncertainty exists in the absolute determination of chlorophyll concentration, indicating that an airborne laser remote sensing system should be supplemented by 'sea-truth' measurements at several points in the area under surveillance.

This study was conducted in conjunction with the Zoological Institute, the University of Stockholm and the Swedish Nature Conservancy.

E2 Communications

- (20) FOA Report C 30173-E2
 Fibre optic communication. A review
 Hans Ekblom September 1979

The technical and commercial development of fibre optics for communication is proceeding at an increasing rate. To illustrate the current situation some 80 articles from periodicals, published mainly during the last two years, have been studied. The report presents a summary of this study. Special attention has been paid to the transmission properties of fibres, their resistance to mechanical loads and environmental effects. Many potential applications exist in military technology, and wide-ranging development activities are in progress overseas in order to match the properties of fibres and components to the specific requirements laid down. Some forecasts are reproduced as to future developments. In order to simplify the subject for those without any previous contact with this technique, a summary is given of some of the fundamental concepts. Detailed articles can be identified from the list of references.

- E3 Guidance, navigation and target identification
(21) FOA Report C 20309-E3
Design of a type III guided missile and parametric studies of missile performance by simulation using CSMP
Kurt Andersson and others July 1979

The report deals with a rough design of the missile fuselage and the weight of sub-systems for a guided missile of about 40 kg take-off mass. Some simple calculated estimates and arguments are presented.

The report goes on to deal with velocity profiles, ranges etc obtained by computer simulation using CSMP. A number of parameters were varied including motor duration specific impulse and take-off weight.

The report forms part of a missile study by Section 220 during 1977/78.
A list of reports from here is contained in Appendix A.

- (22) FOA Report C 20310-E3
CSMP program for analysing speed and range for a given missile with
given drag program
Erik Åström July 1979

The report describes a CSMP simulation program. This can be used in the simulation of the missile parameters of speed and range. Longitudinal acceleration and lateral manoeuvre were also studied.

The report forms part of a missile study by Section 220 during 1977/78.
A list of reports from here is contained in Appendix A.

- (23) FOA Report C 20311-E3
Limitations to command line of sight guidance for a type III missile
Gösta Hall and others July 1979

For a number of different line of sight guided missiles an investigation was made into the limiting effects caused by stipulations as to look angle, acceleration and approach speed. The report forms part of a missile study at Section 220 during 1977/78. A list of reports from here is contained in Appendix A.

- (24) FOA Report C 20312-E3
The kinematics of command line of sight guidance
Jonas Agerberg July 1979

The maximum permitted values for the lateral acceleration and angle of sight (the angle between a missile's longitudinal axis and line of sight) of a command line of sight missile are often limited by the missile's ability to satisfy the condition of on axis trajectory.

This report describes a computer program by which the lateral acceleration of a missile and its angle of sight at the point of impact (where the requirement is generally greatest) can be easily computed.

The report forms part of a missile study by Section 220 during 1977/78.
A list of reports from here is contained in Appendix A.

- (25) FOA Report C 20313-E3
Kinematic model of a collimation-guided SA missile (*KINK*)
Göran Lyman and Inga Nordström July 1979

This report contains a mathematical model of the trajectory for a collimation-guided SA missile fired at a manoeuvring target. The model is three-dimensional, though the target can perform only one manoeuvre with a constant load factor in any direction. The missile trajectory is kinematic, ie the missile is assumed all the time to be on the line of sight to the target. The description of the trajectory is very precise, being integrated from the thrust/drag forces. Allowance is made for the density of air and the variation of the speed of sound with height, induced drag is derived together with an empirical supplementary/drag factor due to the launch impulse.

Two programs have been written for simulation of the target and the missile. The programs are largely identical, though there are some differences in the programming language, the integration package and computer. A list of programs and a user's guide to the most easily manageable of the programs, *KINK 22*, is contained in Appendices 1 and 2.

The report forms part of a missile study by Section 220 during 1977/78.
A list of reports from this study is contained in Appendix 4.

- (26) FOA Report C 20314-E3
The effect of the sideways-looking ability of the homing system on the coverage area of an azimuth homing missile system
Ake Assarsson July 1979

This report shows how the sideways-looking ability of a missile homing system (its maximum look angle) theoretically affects the system's coverage area for constant and variable speeds of the missile. Examples are also given of limitations of the coverage areas for a missile having a given speed curve. This last result is based on simulation by a kinematic model of an azimuth homing missile, developed by Inga Nordström and Göran Lyman (see the list of reports at the Appendix). It concludes with some rules of thumb for a simple means of deriving approximate limits to the coverage areas for variable missile speeds. The target in all cases is assumed to travel on a straight trajectory at a constant speed. Conditions become considerably complicated for a manoeuvring target; the term coverage area loses its simple meaning and simulation is then as a rule the only means of deriving the limitations on performance.

The report forms part of a missile study by Section 220 during 1977/78.
A list of reports from here is contained in the Appendix.

- (27) FOA Report C 20315-E3
 Kinematic model for an angular homing SA missile (*KINM*)
 Göran Lyman and Inga Nordström July 1979

This report contains a mathematical model of the trajectory for an angular homing SA missile fired at a manoeuvring target. The model is three-dimensional, though the target can perform only one manoeuvre with a constant load factor in any direction. The missile trajectory is kinematic, ie the missile is assumed all the time to satisfy the condition of the line of sight. The description of the trajectory is very precise. It is integrated from thrust/drag, which are functions respectively of time and the Mach number. Allowance is made for the density of air and the variation of the speed of sound with height and induced drag.

The model is programmed for DEC-10 and a list of programs is attached together with a simple user's description (Appendix 2 and 3). The program (*KINM* 22) is largely based on the *KINK* 22 program, which describes a collimation-guided missile (FOA Report C 20313-E3, see Appendix 5). *KINM* was produced in quite a short time for the missile study in the Section, and has therefore not been sufficiently tested on real missile launches, and it contains some defects.

This report forms part of a missile study by Section 220 during 1977/78. A list of reports from this study is contained in Appendix 5.

- (28) FOA Report 20316-E3
 A simplified single plane model to determine the possible accuracy of target ranging
 Börje Lindström July 1979

The model estimates the possible accuracy of position-finding when this is obtained by measurements of range and angle. Uncertainty in the target trajectory is due to accelerations by the pilot (or engine). All the uncertainties are simulated as uncorrelated stochastic processes. The filter for position-finding is of the Kalman type. For reasons of geometry the calculations are approximate, though they can be considered as forming a lower limit to what a filtering algorithm ought to be able to perform. The filter is suitable for digital (sampled) calculation.

This report forms part of a missile study by Section 220 during 1977/78. A list of reports from here is contained in Appendix A.

- (29) FOA Report 20317-E3
 The miss distance for line of sight guidance by command from a ground station
 Åke Assarsson July 1979

The report described a schematic study of the miss distance for a SA missile guided by command from the ground against a computed point ahead. The

miss distance is assumed to derive from the final line of sight guidance phase, and is caused by stochastic errors in angle measurement to the target and of the missile angle, and by stochastic evasive action by the target. The miss distance is found to be of an order of magnitude such that the method of guidance requires further analysis.

This report forms part of a missile study by Section 220 during 1977/78. A list of reports from here is contained in the Appendix.

- (30) FOA Report 20318-E3
Simulation of SA missile guidance when launching from fixed mountings
Karl-Erik Olsson July 1979

The report deals with kinematic studies of SA missile guidance. The guidance strategy in question is against an instantaneous point ahead, and launching is assumed to be from fixed mountings. Kinematic missile trajectories have been calculated in advance by computer simulation. The coverage areas have also been sketched in the form of a four-point area. The programming was done in CSMP.

This report forms part of a missile study by Section 220 during 1977/78. A list of reports from here is contained in Appendix A.

- (31) FOA Report C 20319-E3
Some alternative guidance principles for SA missiles
Magnus Herolf July 1979

Various problems of missile guidance have been investigated, and a number of principles formulated. A study has also been made of the estimation of target trajectories and prediction with direct reference to the guidance problem. This study was conducted during a limited period, 1977/78, under the terms of a missile study project in Section 220. The report constitutes a preliminary study. The following subjects are considered:

- (1) Estimation of target trajectory and target models
 - (a) Regression methods
 - (b) Adaptive Kalman filters
- (2) Non-linear prediction
- (3) Guidance
 - (a) Guidance with angle of advance: PFVF
 - (b) Guidance with monitoring of lateral acceleration: PTAF
 - (c) Guidance to the collision point.

A list of reports under the project is contained in Appendix A.

H HUMAN ENVIRONMENTH1 Investigations, future projections

(32) FOA Report C 60005-H1

Literature on future projections. A bibliographical list as a basis
for assessing our ability to withstand physical and mental stress
Gertie Elsässer

July 1979

In the departmental minutes of 10 January 1975, the Council of State and the PUS of the Defence Department, ordered a paper to be prepared on human ability to withstand physical and mental stress so as to assess the vulnerability of the public. The object is stated in the minutes to be given some idea as to whether and to what extent the human mental and physical abilities in relation to various sorts of threat and violence have changed and are likely to change in the next 15 to 20 years. Professor Jan Agrell of FOA has been given the task of conducting this investigation. The secretary for this study is Gertie Elsässer, who as a member of the investigating team has prepared this bibliography of selected literature on future projections of importance to a continuation of the investigation.

The present bibliography is selective and for obvious reasons is directed mainly to literature of importance in assessing human ability to withstand any future physical and mental stress.

The bibliography covers different subjects. The major field, which is intended to serve as a preparatory document, is termed 'general futurology'. Other fields of interest to us include: energy, catastrophes, conflict and crisis; war, defence and peace research; medicine, psychology and psychiatry; their methods including technology and information. We have also studied fringe subjects such as life at work, population, ecology, economics, politics, etc. It should be emphasised that the demarcation between various fields (for natural reasons) may become slightly blurred. A work for example may belong both under methods and technology/data gathering etc. We have tried as nearly as possible to give a logical division, though of course in some cases it may be argued whether the breakdown is quite adequate.

Our subject fields are spread over books, periodicals, reports and pamphlets. We decided broadly to subdivide the material in the same way as the FOA Library. The demarcation between books and pamphlets may sometimes be uncertain, since printed matter is combined with pamphlets, even when of only a few pages. Duplicated materials are included under pamphlets, and reports which do not belong to series are mainly included under pamphlets. Some quite short articles may sometimes be found under periodicals, but they are included as being

of interest to our continuing activity. Occasionally books include not only original publications but also translations into other languages.

The bibliography is arranged in the ordinary way in alphabetical order. The year and place of publication have been entered, though where not available we have entered the publisher and his address.

The bibliography covers about 1/3rd of the material collected. The collection was done by visits to libraries and institutes, the perusal of Swedish and foreign periodicals, information searches etc.

In glioma cultures the effect of HCP on energy metabolism was less pronounced. HCP however produced some drastic morphological changes, presumably due to an effect on the cell membrane. It is suggested that HCP exerts its toxic action via an effect on the same mechanisms in cell cultures as *in vivo*.

- (34) FOA Report C 54027-H2
GRAF - an auxiliary program for presenting functions in rectangular coordinates with the Tektronix 4051
Carl Reuterswärd June 1979

The program controls general routines for a dialogue in which the user specifies the input values for drawing curve scales: continuously and discontinuously variable parameters, other parameters and graduations of coordinate axes. The user's contribution to the software consists mainly of subroutines describing algorithms for the computation of functions.

The program code is written in *BASIC*, *PLOT 50* version (copyright 1975 Tektronix Inc) for interpretative execution.

The program uses *RAM*, which is a general auxiliary routine for designing rectangular coordinate systems for graphs. The arrangement, lengths, scales and graduations of coordinates are specified in a dialogue with reference to the units of the user's data.

The program can be used for obtaining the relations between climatic factors, the climate index and the physiological effect in model studies of climate problems, eg in occupied shelters. The report describes the program and the method of using it.

H3 Environmental extremes

(35) FOA Report A 59004-H3, H9

Proposal for the content of the Air Force emergency pack
Ove Wilson and others

August 1979

The introduction of a new emergency transmitter (Emergency radio 713) in the Swedish Air Force has raised the question of the contents of the emergency pack.

The former type of emergency transmitter (DIANA) was placed in the emergency equipment pack. Emergency radio 713 is now placed in Life Jacket 8. Now that DIANA is being removed from the emergency pack it leaves room for other emergency equipment. Some criticism has been directed at the suitability of the present emergency equipment.

(36) FOA Report C 58005-H3

Man in the sea. Development trends in underwater activity in the 1980s
Bo Cassel

August 1979

In the context of the rapid developments in deep-sea diving and other underwater activities, the report discusses some development trends for the next decade.

Greater working depths and difficult weather conditions, eg Arctic waters, impose fresh problems on scientists and engineers. Increased cooperation among scientists, public authorities and industry will become necessary, together with international projects between two or more states.

H6 Individual and group efficiency

(37) FOA Report C 52002-H6

Performance on tasks with different degrees of memory stress and its relation to morning/evening habits and body temperature
Jan E. Fröberg

April 1979

Performance on tasks having different degrees of memory stress was studied during 75 waking hours in groups of test subjects who from habit were either morning or evening subjects. The task with the high memory stress was in inverse phase, as regards its diurnal function, to that with a lighter memory stress and the body temperature. After one night's lack of sleep the memory performance also followed the rhythm of body temperature, except in the case of the most extreme evening subjects, who continued to exhibit an inverse memory rhythm.

- (38) FOA Report C 52003-H6
 Psychobiological 24-hour patterns. Theory, methods and summary of empirical studies
 Jan E. Fröberg

April 1979

The chief object of this work was to study 24-hour rhythms in various types of performance, subjective alertness and physiological variables, together with their mutual relationship in time and relation to individual diurnal habits. Groups of test subjects were isolated without sleep during 72 hours. Various types of performance, subjective alertness, body temperature and hormone secretions were measured in these groups at 3-hourly intervals. The results demonstrated significant 24-hour rhythms in body temperature, secretion of adrenalin, estimates of alertness and certain measures of performance. Differences in phase among these rhythms were also shown. On the other hand no differences were found between habitual morning and evening subjects. However an interaction did exist between this dimension and the type of performance demanded, such that extreme 'morning subjects' exhibited an almost inverted 24-hour rhythm in a task of the short-term memory type.

- (39) FOA Report C 56019-H6
 Identification of vehicle silhouettes as a function of observation distance
 Björn Modéer

August 1979

A laboratory experiment was arranged in order to study the identifiability of five Swedish military vehicles, as a function of distance.

Silhouettes had been made of the vehicles, drawn in black water colour on white paper to a scale of 1:400. They were illuminated by a spotlight from behind. Eleven test subjects were made to evaluate 160 observations divided into distances of 7.5, 11, 14.5 and 18 metres, which corresponds to 3.0, 4.4, 5.8 and 7.2 km on a 1:1 scale of images.

The results show that they managed to make considerably more reliable identifications than were subjectively thought possible. The mean values for identifiability vary from 86.4% at the shortest range to 56.8% at the longest. Clear differences exist between the identifiability of vehicles at longer ranges. Confusions mainly arise with vehicles most nearly similar in size.

H7 Testing and job analysis

- (40) FOA Report C 55033-H7
 A new aspect of job analysis. The effect of individual development and a variable working life on models and methods
 Gunnel Frenzel-Norlin

June 1979

A brief introductory review of present-day applications of psychological job analysis is followed by some examples of studies in job analysis carried out at the Department of Defence.

In a review of the literature on recent research in job analysis on which this report is based, a selection has been made of the methods and models of job analysis. Consideration has been paid both to the models' foundation in modern psychological theory and to their applicability in the Swedish Defence services.

In order to be able to develop the models of job analysis listed here, and to adapt them to the special requirements which may occur in defence, opportunities are needed for applying the models and methods. An instance is given of one possible program of work, the main purpose of which is to acquire information by which to place personnel in a large number of jobs.

- (41) FOA Report C 57004-H7
 Symposium on 'Female Performance' - some mental, social and physiological aspects
 (Summary of papers delivered)
 Monika Cedermark and others

June 1979

In November 1978 the Swedish Parliament passed a resolution that certain employments in Defence should be thrown open to women. At the same time efforts have been made among the public to grant women access to jobs which have traditionally been regarded as 'male'. Equal rights for women are in many respects no longer questioned today but are taken for granted. Certain exaggerations have entered into the debate on equal rights, mainly on the subject of differences in the ability of men and women to perform heavy physical work. Since many of the jobs for Defence employees involve physical labour of different types and intensities, it is to be expected that some argument will arise as to the jobs to be made accessible to women in Defence activities. In order to facilitate a realistic discussion the Institute of Defence Medicine of the Institute of Defence Research and the Office of National Service has thought fit to define the current front line of research into female work performance. We have therefore consulted a number of the most prominent scientific authorities in Scandinavia in the fields of the physiology of labour, ergonomics, neurophysiology, endocrinology, gynaecology, psychology, the psychology of labour and psycho-sociology and also, what is perhaps the most important, representatives from the world of employment with experience of the functions in which men and women are already on an equal footing. This consultation led to the symposium on 'Female performance - some mental, social and physiological aspects held in Stockholm on 22 March 1979'.

Interest in the symposium was keen and many requests were made for a record of its content. Participants at the symposium have readily made their material available for a summary. It is our hope that this may serve as a source

of facts when it comes to continuing the discussion, with special reference to what employment in the Defence services can be directly opened to women.

H8 Training procedures

(42) FOA Report A 55004-H8

Group psychology in the Army: a view of the problems, working principles and suggestions

Inga-Lill Täljedal Blomgren and others

August 1979

The studies in group psychology conducted in the Army between 1972 and 1979 have been analysed. This analysis has resulted in a view of the problems for group psychological studies and the principles of applied group psychology. Three types of objective for group psychological activity have been identified. The report concludes with an account of some suggestions concerned respectively with the three types of requirement in the Army organisation.

H9 Man and machine systems

(43) FOA Report A 54004-H9

Biotechnology in information and control systems. Some examples.

Documentation from a FOA information day, date of review 22 November 1978

Fritz Hjelte and others

June 1979

The report presents from the FOA review day, 22 November 1978 all the illustrations from the lectures and in its entirety the paper on Display and Communication Systems: indicator and manoeuvring systems.

The information day was intended to provide information to those personnel whose duties require them to possess a relatively general appreciation of the subject-matter in question. The information deals with the state of knowledge in the field, as exemplified by applications chiefly in flying, but it also concerns other sections of the overall defence effort in which problems of information, display and control play a prominent part.

(44) FOA Report C 56020-H9

Man and machine. An ergonomic perspective of various needs for information, objectives and work patterns in system development

Hans Furustig

October 1979

Ergonomics is a collective noun for activities on various levels (sub-disciplinary, disciplinary or inter-disciplinary). The orientation of ergonomics may be scientific (biotechnology, technical psychology), constructivist (work study) or humanist (research in the sociology of labour). This multiple significance plus the existence of different needs for information and differing views on the role of the ergonomist all contribute to competing patterns of work in system development.

In order to be able to discuss the points of view and work patterns in system development a model is presented containing the following categories:

- (1) conception of reality (inter-disciplinary premises),
 - (2) prototype images in the activity,
 - (3) viewpoints and methodology (work patterns),
 - (4) areas of investigation (objects of study and needs for information).

The models are tested by exemplifying several scientific traditions and viewpoints in their own terminology.

M INTERDISCIPLINARY STUDIES AND INVESTIGATIONS

M2 Environment and social studies

- (45) FOA Report C 10113-M2
American-Soviet relations: a retrospect and discussion of the future
Manne Wängborg February 1979

The first of the two main sections of the present report is a retrospective review of developments in US-Soviet relations in the postwar period. The emphasis here is on military and strategic aspects.

The second section consists of a theoretical discussion of various factors for change and uncertainty in the future development of superpower relations leading to the conclusion that most of them point towards a continued relationship marked by a mixture of conflict and cooperation. This is a relationship which will perhaps fluctuate between different degrees of conflict and cooperation, but which has equally been found to be quite stable.

This study forms part of the 'Western Project'.

M3 Studies in security policy and the environment (previously 'Predictive planning')

- (46) FOA Report C 10142-M3 (E5, H9)
Processing of remote-sensing data. Conference report
Jacob Palme and Jörgen Pihl September 1979

This report consists of abstracts from the international conference on Teleinformatics 79 in Paris, 11-13 June 1979, and a seminar on the office of the future, held in association with this conference in Paris, 8-9 June.

In the near future we shall have access to very cheap data resources in conjunction with relatively low costs for long-distance transmission of information over the public communication network. This development will afford a number of new technical possibilities. We can expect for instance that increasing quantities of the information now being committed to paper and sent by letter will

instead be stored and distributed electronically. This will not only affect offices, but the domestic home will perhaps also obtain its information electronically in the future. For example perhaps we shall have a data display coupled to a central database instead of telephone directories in the house.

The conference was not marked by any starry-eyed trust that all these changes will improve society, but by a serious discussion of the advantages and disadvantages of the various alternatives offered by technology.

(47) FOA Report C 10143-M3

What governs the foreign-policy actions of the super-powers?

Christer Jönsson

August 1979

Political statements as to resemblances in the foreign-policy actions of the American and Soviet super-powers are often heard in the world today. However the specialised scientific literature on American and Soviet foreign policies tend to emphasise their peculiarities rather than their similarities. This report evaluates the foreign policies of the super-powers in the light of a number of explanatory factors as frequently expressed. The guideline of the inquiry is: what types of resemblances and differences in foreign policy can be expected on the basis of these underlying variables?

The underlying variables dealt with include:

- (1) nuclear weapons and other resources,
- (2) historical factors,
- (3) ideology,
- (4) political system,
- (5) social and economic systems and
- (6) inter-state relations and the international system.

The report is by way of being a 'mental experiment' rather than a strictly-conducted examination of the relationship of causes between independent variables and the foreign policies of the super-powers.

The factors discussed point to the possibility of both similarities and differences in the foreign policies of the USA and USSR. The foreign-policy ideologies of the super-powers and their systems of foreign-policy decision-making tend chiefly towards their similarities. However dissimilar effects in foreign policy follow from the economic resources and systems of the super-powers.

This study forms part of the 'Theory Project'.

M4

Interdisciplinary studies of technical systems (previously 'Systems and program planning')

(48)

FOA Report B 10032-M4

Future naval warfare in Europe. Supremacy at sea

Walter Wicklund

The task of naval forces is to maintain, acquire or contest supremacy at sea. This supremacy is a condition of ensuring one's own and denying the enemy's use of the sea as a transport route. If it is impossible to acquire absolute supremacy at sea, it is necessary to seek local or temporary supremacy in order to deploy one's own naval forces quickly and efficiently against the enemy or to move other weapons of war to his territory.

These are classical principles, though still valid today. Technical development have placed additional demands on the naval forces: as hidden launching pads for nuclear warheads and for the defence of one's own installations at sea, eg drilling rigs and other plant for extracting raw materials from the seabed.

This article deals with the composition and tasks of the naval forces and the importance of ensuring seaborne transport during any future European war.

Offprint from *Försvar i Nutid* (1979), 3. FOA Reprints 1979/80:1.

- (49) FOA Report C 10141-M430
 Appreciation of land warfare in strategic studies. Discussion of the DJUP model and its supporting papers
 Hugo Wiechel

July 1979

The report contains comments on the DJUP model and its supporting papers. Questions concerning aircraft and helicopters are not dealt with.

DJUP is a computerised model for the schematic study of army organisation and principles of grouping with reference to the nature of the ground, topography and climate. It automatically simulates the course of battle for a number of divisions and brigades along one or more lines of advance within a theatre of operations by selected stages. The areas and zones for evaluation can be easily adapted to the overall geographical conditions.

DJUP cannot be regarded as a self-contained model. Both in its basis and design it is historical, and for predictive purposes is based on underlying studies. DJUP is not suitable for the investigation of various minor specialised questions. These can be covered more easily and cheaply at lower levels.

The visible basis, which is very concentrated, is the result of underlying levels of study, and represents a comprehensive work program.

Restrictions on the use of the model and the admissible conclusions are incompletely stated.

Any future application of DJUP will require continuing work at lower levels of study in order to generate the necessary information.

Particular attention ought to be paid to the choice of level of objectives for the future. The question of uncertainties in the presentation of

results should be especially noted. Given the proper effort in labour and time, the model can be developed so as to satisfy to an increasing degree the stringent requirements imposed by strategic studies. An exact evaluation of requirements against resources will be needed in future.

Specialised information and valuable advice have been supplied by Jan Foghelin, Tore Isacson and Helge Löfstedt. Useful comments have also been received from Rolf Arremark, Gunnar Cronholm, Jan Höglund, Ove Kallin, Stig Magnusson, P.O. Nilsson, Mats Ohlin, Bengt Söderlund, Lars Wigg and Anders Östrand.

M5 Economic studies (previously 'Forecasts')

(50) FOA Report C 30162-M5

Papers on the outlook ahead by FOA 3, 1978. Technical and scientific forecasting and long-terms trends in research
Bengt Kleman

December 1978

The collected information formed the basis for the Outlook Ahead 1978 by FOA 3 under the headings 'Technical and Scientific Forecasting' and 'Long-term Trends in Research'. The material covers 14 subject fields in the subdivisions listed in Informationsteknik 76.

M6 Information systems (previously 'Miscellaneous investigations and surveys')

(51) FOA Report C 10129E-M6 (E5)

COM teleconferencing system - concise manual
Jacob Palme and Lars Enderin

July 1979
(in English)

(52) FOA Report C 10129S-M6 (E5)
(Swedish version of (51))

(53) FOA Report C 10144-M6
Orders for VIDEDE and DEC-10
Tord Beckman

September 1979

VIDEDE is a system for printing and editing all types of text. It can be used on the DEC-10 computers at the Stockholm Computer Centre (QZ), FOA 3 at Linköping (FILIP) and at the University of Linköping (LIDAC). The report contains detailed information and instructions both on the normal orders in VIDEDE and on the orders and procedures in the DEC-10 system which need to be known in order to use VIDEDE.

(54) FOA Report C 10145-M6

Concise order code for VIDEDE and DEC-10
Tord Beckman

September 1979

The report contains a concise list of the normal order codes in the VIDEĐ word-processing system and the DEC-10 computer. It is an offprint of the last three pages of FOA Report C 10144-M6, Tord Beckman, 'Orders for VIDEĐ and DEC-10'.

- M8 Joint studies and research (previously combined research and studies)
 (55) Report SP 1978:1
 Systems analysis and predictive studies - some doctoral degree courses
 Brita Schwartz and Uno Svedin

Several inter-disciplinary doctoral degree courses in systems analysis and predictive studies have been organised in Stockholm in recent years. In order to facilitate the organisation of new courses in this field, in Stockholm or elsewhere in the country, we have assembled some general information on these courses. We therefore give an account here of the composition and purpose of the courses, with a list of references, comments on the literature and some examples of the selection of articles.

The description covers three different courses, each representing five points in the doctoral program. The courses, which differ somewhat in structure, are denoted:

- Predictive studies (KTH, SU)
- Inter-sectoral analysis of systems (SU)
- Systems analysis as a basis for decision-making (EFI, SU).

The course on predictive studies was previously documented in report form (Report TRITA - LIB - 5002, KTH), though since the edition is at present exhausted, this course is also included, using here and there the information contained in this report.

- (56) Report SP 1978:2
 Energy supply profiles and freedom of action - preliminary study
 Ingemar Lekteus and Brita Schwartz

The present report is an account of a preliminary study initiated by the Working Party on Energy Research (DFE) under the research programme 'General energy system studies' (DFE project number 33.03(m)). The object was to specify the composition of a study to throw light on various matters affecting freedom of action in the energy field.

The method which was developed consists in specifying some types of uncertainty in international developments of importance to the Swedish import of energy, by describing different scenarios for development in the next decades. Accordingly, various 'social scenarios' are being developed to describe the alternative developments in Sweden concerning the volume of production etc, ie factors of importance for the consumption of energy. The consequences of

different measures taken to ensure freedom of action, eg various types of R & D and investment, are studied for different alternative scenarios and with reference to the possibilities for avoiding some of the future energy supply problems, making allowance for different types of restrictions and for re-orienting Swedish energy supplies in the long term towards new energy supply profiles, known as structures.

An important idea in this project is to provide some insight into questions of freedom of action by developing an interactive simulation model to illustrate the development of energy supplies and consumption over time. The user is meant to interact by stating different types of decision with respect to certain types of measure taken to obtain freedom of action.

The project is expected to continue for one or two years. Possible beneficiaries of the project, apart from DFE, include anyone having an interest in a general survey of long-term developments in the energy field.

The main body of this preliminary study was carried out in autumn 1977. Since the appearance of the Final Report of the Energy Commission, a supplement has been added to Chapter 5.

(57)

Report SP 1978:3

Planning and freedom of action - some examples from the energy field
Ingemar Lekteus

'Freedom of action' is a term, which apart from having an everyday meaning, is also used as a technical term in planning theory. This report is an account of a general analysis of the concept, taking examples from the energy field in Chapters 2 and 3. The term freedom of action in recent years, and especially in the energy field, has come to be more widely used in connection with the formation of, and attitudes towards, alternative political decisions. In the context of planning theory the use of the term in the 1975 decision on energy (Chapter 4) and in the deliberations of the Energy Commission (Chapter 5) is scrutinised here.

In the 1975 decision (Proposition 1975:30) the term 'Freedom of action' is used in connection with adaptive planning, where it means the possibility in some future decision situation of choosing between different alternatives for the development of the energy system. Chapter 4 states in conclusion inter alia:

Freedom of action in the Proposition is mentioned only with reference to adaptivity and, eg not in connection with flexibility,

Freedom of action in the Proposition is used chiefly with reference to nuclear power, and

measures to gain freedom of action on nuclear power are not considered as being involved with any major direct sacrifices.

The principal finding of the Energy Commission (SOU 1977:17) is heavily imprinted with different types of discussion on freedom of action, eg in connection with the formation of, and comparisons among, its four main alternatives. It is shown in Chapter 5 that, compared with the 1975 Proposition, the concept of freedom of action has acquired a broader meaning, eg by the introduction of the expression 'freedom of action in energy policy', which is defined as the ability to plan and adopt energy policy measures 'such that energy supply and demand at any time are in balance without the need for any intervention which conflicts with the overriding objective of social development'. By this definition freedom of action in energy policy becomes an important objective of energy policy, and the statement in the finding, that energy policy should be devised so as to maintain the greatest possible freedom of action, is a logical consequence of this. The difference arises here between freedom of action in energy policy in the finding and freedom of action in adaptive planning, where it is always a matter of judgment as to how much freedom of action one will have. It should be noted that the fact that freedom of action in energy policy as per the finding should be as large as possible does not imply that all measures which afford increased freedom of action (in terms of planning theory) ought to be adopted.

In the finding by the Energy Commission the term freedom of action is used in a similar sense to the 1975 decision on energy policy, ie with respect to adaptive planning. The term however is also partly considered to cover other methods which can mitigate the disadvantages of uncertainty, eg flexibility and the spreading of risk.

Chapter 6 shows that the energy sector comprises various main types of question on freedom of action, and that it may be important to distinguish among them. Three main types of question are defined as affecting freedom of action, viz in technology, in organization and in a crisis, and the implications are illustrated by concrete examples from different studies. The examples are drawn partly from the finding of the Energy Commission and from the predictive study 'Uranium or the Sun'.

- (58) Report SP 1978:4
 Planning as a basis for policy
 Brita Schwartz

Planning often takes its starting point from a given policy. It also happens however that planning is devised so as to provide support for changes in policy. In such cases it fulfils the same function as a prescriptive policy analysis. In this article some examples are given of the latter type of planning, with a view to identifying those features characteristic of planning which affords

a basis for policy decisions. The examples cover both company strategic planning and public sector planning in transport, education and defence. In conclusion an outline is sketched for a 'checklist' of theoretical conditions for sectoral strategic planning.

- (59) Report SP 1979:1
 Linking research planning to sectoral planning
 Brita Schwartz (in English)

The organisation and planning of research and development, R & D, and the development of a sectoral research policy is important for development in various sectors, such as health, transport, agriculture, defence etc. The object of this article is to examine the relation between long-term sectoral planning and R & D planning. It proceeds from experience of a recent transport planning study, the purpose of which was to contribute a basis for the organisation of transport research. As a general background a brief review is given of the historical development of discussions on research policy, and of the conceptual plan characterised as a development from 'applied research' to goal-oriented and sectoral research. This is followed by a description of elaboration of the transport study and a discussion of the usefulness firstly of planning and predictive studies for the guidance of R & D, and secondly of R & D for planning purposes. It is stated in principle that predictive studies and sectoral strategic planning can contribute to the identification and formulation of problems and can also provide a basis for assisting the scientist to state his R & D problems. In conclusion however it is stressed that considerable differences exist among various sectors, both as regards the requirements which should be imposed on the design of the planning processes and as to the opportunities and means of deriving knowledge from such processes which is both applicable and applied to the direction of R & D activity.

N MILITARY ENGINEERING RESEARCH

- (60) FortF/F Report No. 109:19
 Concrete slabs supported on slender columns under short duration loads. 2. Dynamic test results and design recommendations
 Håkan Sundquist April 1979
 (in English)

The report is a partial account of a project, the object of which is to examine some of the problems current in the dimensioning and design of concrete slabs on pillars under short duration loads. Test results are reported for five slabs tested under short term dynamic load. The stresses to which the slabs were subjected are of a type applicable to shelters, light fortifications,

control rooms in the process industries, buildings liable to subsidence and so on. The report also describes the methods of theoretical evaluation of experiments and the dimensioning methods, based on them, for slabs supported on columns.

An account is given of a mathematical model based on both static and dynamic test results, which enables the mode of action of the test slabs to be described. The model is relatively simple in construction and it assumes that bending of the test slabs can be characterised by only one mode. As a justification for this apparently rough assumption both theoretical calculations and test results are reported. Despite the simplicity and purely mechanical structure of the mathematical model, the calculations required appear to be complicated inasmuch as the deformation relationships in the systems which constitute the model are non-linear, and as allowance must be made for the effect of recovery moduli.

Despite the rough assumptions and the difficulty of the calculations, it was found that the mathematical model employed is actually capable of describing the mode of action of the test slabs. Evaluation of the experiments also demonstrates that it should be possible to use the same fracture criteria both for static and dynamic loads.

- (61) FortF/F Report No. 109:20
Concrete slabs supported on slender columns under short duration loads. Summary
Håkan Sundquist (in English)

The report is a summary in Swedish and English of Transactions 124, 125 and 126 from KTH, Institute of Structural Statics concerning the strength of concrete slabs on columns under dynamic load. The three publications under reference have also been issued by FortF, designated as Publ 44 Bk/1977, Publ 45 Bk/1977 and report FortF/F No. 109:19.

The object was to examine some of the current problems of dimensioning and design of reinforced concrete slabs supported by slender columns where the slabs are subjected to short duration distributed dynamic loads. This type of structure occurs solely in certain types of shelter constructed in conformity with technical regulations for standard shelters, Cfs 1974 and 1978. The type of load dealt with in the investigations consist of shock waves, short duration gas pressure and of distributed subsidence loads.

The report includes theoretical calculations and static and dynamic experiments on the slabs. The experiments have been designed so that with reference to the theoretical calculations it will be possible to verify whether

the same mechanical models of the mode of action by the slabs can be applied both to static and dynamic loads.

The report presents rigorous dynamic models in which the static and dynamic actions are coupled by adding the effect of inertial forces to the equations of equilibrium and by inserting the fracture condition as a criterion of deformation and not as a criterion of force or strain.

Academic thesis, KTH, Stockholm 1979.

- (62) FortF/F Report No. 117:9
Man and ground shock
Eddy Abrahamsson

July 1979
(in English)

A number of questions concerning human powers of withstanding the effects of ground shock have inspired this survey. To begin with an undamped system having one degree of freedom is studied in order to examine the meaning of the assertion that something 'cant stand so many g'.

Questions are next dealt with concerning several degrees of freedom, the effects of damping and different forms of acceleration impulse.

The report finally presents resistance curves after Payne with a recommendation for their continued use with reference to fortifications.

- (63) FortF/F Report No. 121:6
Punch-loaded shotcrete linings on hard rock
Jonas Holmgren

March 1979
(in English)

Large-scale experiments are reported involving a granite block forced through a layer of shotcrete.

Unreinforced layers of shotcrete of different thicknesses and geometry were tested. Reinforced shotcrete was also tested in conjunction with rock bolts.

The importance is shown of the adhesion between shotcrete and rock, and the fact that this is decisive for the load-bearing capacity of the reinforcement for certain types of stress.

Curves for load versus elongation are presented for concrete-injected reinforcement bars, clearly demonstrating that concrete injection considerably reduces the deformability of the reinforcement.

The report includes finite-element calculations of the state of strain in a joint when bridged with shotcrete.

The thesis is introduced by a review of the literature with a discussion of the design of shotcrete reinforcement.

Academic thesis, KTH, Stockholm 1979.

- (64) FortF/F Report No. 126:2
ABRAM 78. Underground ammunition storage - a risk analysis model 1978
Eddy Abrahamsson
February 1979
(in English)

A proposal is made for a model of overall risk evaluation in peacetime with reference to underground ammunition storage. The model conforms to directives issued by ÖB. The proposal involves the use of a theoretical procedure for the risk analysis of an accidental explosion in a permanent underground ammunition store. The assessment is based on specified concepts of risk, and the purpose of the model is to clarify the risks to individuals in the vicinity of an installation for different degrees of occupancy of the storage. The result of the assessment might form the basis for decisions as to permissible storage density in an installation. The model as such is intended only as a means towards a final decision as to the presence or non-presence of the storage and the permitted quantities of ammunition. The final decision will involve economic, transport and operational aspects, which are not dealt with here. It is fair to assume that with relative simple modifications the model could also be used for free-standing storage and for the evaluation of new construction.

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